SPECIFICATION L–110. INSTALLATION OF AIRPORT UNDERGROUND ELECTRICAL DUCT

DESCRIPTION

110–1.1 GENERAL.

a. This Work consists of underground electrical ducts and underground conduits installed in accordance with this Specification at the locations and in accordance with the dimensions, designs, and details shown in the Contract Documents. Also include all excavation, trenching, backfilling, removal, and restoration of paved areas, manholes, concrete encasement, mandreling, installation of steel drag wires and duct markers, capping, and the inspection of the installation as a completed duct system ready for installation of cables, unless otherwise shown in the Contract Documents.

110-1.2 THIS SPECIFICATION INCLUDES:

a. Regulatory Requirements.

110-1.3 OTHER RELATED SPECIFICATIONS.

a. L100-1.1 through L-100-2.17 General Requirements.
b. L-100-3.2 Raceways.

110-1.4 CLASSIFICATIONS.

a. Type I - Duct encased in concrete.
b. Type II - Duct without concrete encasement.

EQUIPMENT AND MATERIALS

110–2.1 REGULATORY REQUIREMENTS. All equipment and materials shall be subject to acceptance through manufacturer's certification of compliance with applicable specifications and as required in Specification L-100.

CONSTRUCTION METHODS

110–3.1 GENERAL. Install underground ducts at the approximate locations shown in the Contract Documents. The Engineer will indicate specific locations as the work progresses. Ducts shall be of the size, material, and type indicated in the Contract Documents. Where no size is indicated in the plans or specifications the ducts shall be not less than 3 inches (75 mm) inside diameter. Lay all duct lines to drain toward handholes, manholes and duct ends. Grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, grade the duct lines from the center in both directions toward manholes, handholes, or duct ends. Avoid pockets or traps where moisture may accumulate.

Mandrel each duct. Push An iron–shod mandrel, not more than 1/4–inch (6 mm) smaller than the bore of the duct through each duct by means of jointed conduit rods. The mandrel shall have a leather or rubber gasket slightly larger than the duct hole.

All ducts installed shall be provided with a No. 10 gauge galvanized iron or steel drag wire for pulling the permanent wiring. Where steel spare ducts are installed, as indicated on the plans, plug the open ends with removable tapered plugs, designed by the duct manufacturers, or with hardwood plugs conforming accurately to the shape of the duct and having the larger end of the plug at least 1/4–inch (6 mm) greater in diameter than the duct. Use plugs recommended by the manufacturer for plastic and fiber duct. Securely fasten and plug all ducts in place during construction and progress of the work to prevent seepage of grout, water, or dirt. Do not install duct sections having a defective joint.

Install ducts under runways, taxiways, aprons, and other paved areas in accordance with details shown on the Drawings. When required, provide concrete encasement as shown on Drawings.

Excavate the trenches for ducts manually or with mechanical trenching equipment. Walls of trenches shall be vertical so that a minimum of shoulder surface is disturbed. Do not use blades of road graders to excavate the trench. Ascertain the type of soil or rock to be excavated before bidding. All excavation shall be unclassified and incidental to this Item.

110–3.2 DUCTS ENCASED IN CONCRETE (TYPE I). When shown in the Plans, install concrete–encased ducts so that the top of the concrete envelope is not less than 18 inches (450 mm) below the finished subgrade where installed under runways, taxiways, aprons, or other

paved areas, and not less than 18 inches (450 mm) below finished grade where installed in unpaved areas. Extend ducts under paved areas at least 5 feet (1.5 m) beyond the edges of the pavement or 5 feet (1.5 m) beyond underdrains that may be installed alongside the paved area. Open trenches for concrete–encased ducts the complete length before concrete is laid so that if any obstructions are encountered, proper provisions can be made to avoid them. Place all ducts for concrete encasements on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. Where two or more ducts are encased in concrete, space them not less than 1–1/2 inches (37 mm) apart (measured from outside wall to outside wall) using spacers applicable to the type of duct. As the duct laying progresses, place concrete not less than 3 inches (75 mm) thick around the sides and top of the duct bank. Install end bells or couplings flush with the concrete encasement where required.

When specified, reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where otherwise shown on the Plans. Under such conditions, support the complete duct structure on reinforced concrete footings, piers, or piles located at approximately 5 foot (1.5 m) intervals.

Do not backfill the excavation until concrete has reached 2,000 psi compressive strength.

Clay or soapstone duct is prohibited.

110–3.3 DUCTS WITHOUT CONCRETE ENCASEMENT (TYPE II). Trenches for single–duct lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide, and the trench for 2 or more ducts installed at the same level shall be proportionately wider. Make trench bottoms for ducts without concrete encasement to conform accurately to grade so as to provide uniform support for the duct along its entire length. Open trenches the complete length before duct is installed.

Place a layer of sand, at least 4 inches (100 mm) thick (loose measurement) or as shown on the Plans, in the bottom of the trench as bedding for the duct. The bedding material shall consist of, sand and shall contain no particles that would be retained on a 1/4–inch (6 mm) sieve. Tamp the bedding material until firm.

Unless otherwise shown in Plans, install ducts in accordance with NFPA 70, but never less than 18 inches below the finished grade.

When two or more ducts are installed in the same trench without concrete encasement, install them as shown on the Drawings.

110–3.4 DUCT MARKERS. Mark The location of the ends of all ducts by a concrete slab marker as shown in the Contract Documents. Locate the markers above the ends of all ducts or duct banks, except where ducts terminate in a handhold, manhole, or building.

Impress the word "duct" and the number and size of ducts beneath the marker on each marker. Show the letters on the Contract Documents.

110–3.5 BACKFILLING. After ducts have been properly installed, backfill the trench in at least two layers with excavated material less than 4 inches (100 mm) in diameter and thoroughly tamped and compacted to at least the density of the surrounding undisturbed soil. If necessary to obtain the desired compaction, the backfill material shall be moistened or aerated.

Trenches shall not be excessively wet and shall not contain pools of water during backfilling operations.

Completely backfill and tamp the trench level with the adjacent surface, except that, when sod is to be placed over the trench, stop the backfilling at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Remove and dispose of excess excavated material in accordance with instructions issued by the Engineer.

110–3.6 RESTORATION. Restore turf areas disturbed by the trenching, storing of dirt, cable laying, pad construction and other work. The restoration shall include topsoiling, fertilizing, liming, seeding, and mulching. Perform all Work in accordance with Specifications T–901, T–902, T–904, T–905, and T–908. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance.

Restore paved areas disturbed by Contractor operations in accordance with the detail shown on the Contract Documents. Material specification and installation shall be in accordance with Standard Specifications.